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Antibiotic use in children and the use of medicines by parents

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ABSTRACT

Objective Antibiotic drugs are frequently used for viral infections in children. It is probable that health beliefs and parental concern have great influence on the use of drugs in children. This study, performed in The Netherlands, investigates whether the use of antibiotics in children is associated with the use of medicines by parents.

Patients and methods In this observational cohort study, the authors selected 6731 children from the prescription database IADB.nl who did not receive antibiotics until their fifth birthday and 1479 children who received at least one antibiotic prescription every year. The authors then selected parents for each group of children (5790 mothers and 4250 fathers for the children who did not receive antibiotics and 1234 mothers and 1032 fathers for the children who regularly received antibiotics). The authors compared the use of antibiotics and other medicines between the two groups of parents.

Results Parents of children who received antibiotics recurrently were found to use more antibiotics themselves compared with parents of children who did not receive antibiotics. Moreover, this group also showed a higher percentage of chronic medication use: (11.3 vs 6.2% (mothers) and 13.1% vs 9.5% (fathers)). Mothers more often use antacids, non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, anxiolytics, hypnotics, antidepressants, drugs for treatment of asthma and antihistamines. Fathers use more antacids, cardiovascular drugs, NSAIDs and asthma drugs.

Conclusions The parents of children who receive antibiotic drugs regularly use more medicines compared with the parents of children who use no antibiotic drugs. Parents' medicine use may influence that of children and is a factor physicians and pharmacists should take into account.

INTRODUCTION

Children frequently receive antibiotic drugs. In the Netherlands 200–300/1000 children per year receive antibiotics, mainly for upper respiratory tract infections, which are often viral.^{1 2} Excessive use of antibiotic drugs is a concern due to the risk of bacterial resistance.³ Knowing the determinants associated with prescription of antibiotic drugs in children is valuable if we want to develop intervention programmes to decrease the use of these drugs. The question arises as to whether frequent prescription of antibiotic drugs in children is purely health related or whether social factors such as parental health beliefs and concerns play a part in this.⁴

Two Swedish studies found that children of lower socio-economic classes or whose parents

What is already known on this topic

- ▶ Several family-related factors are associated with recurrent antibiotic prescription in children.
- ▶ These factors include socio-economic class, extensive use of primary care by parents, parents who smoke and severe stress of fathers.

What this study adds

- ▶ Parents of young children who receive antibiotics recurrently use more medicines themselves than parents of children who do not receive antibiotics.
- ▶ This finding also applies to antacids, analgesics, non-steroidal anti-inflammatory drugs and psychotropic drugs.

smoke receive more antibiotic drugs.^{5 6} Parents of children who receive antibiotics recurrently also tend to take regular sick leave from work and appear to be relatively frequent users of primary care.^{5 6} Families who have great concerns about infectious diseases and who consult their physician more frequently also demonstrate a higher use of antibiotic drugs.⁷ Attending a childcare facility, frequent physician visits, formula feeding and severe stress of fathers were found to be factors associated with recurrent antibiotic use in young children in Finland.⁸ A lower socio-economic status is associated with a higher rate of antibiotic prescriptions.^{9 10}

This raises the question of whether parents of children who receive antibiotic drugs frequently also use more antibiotics themselves. Similarly, these parents may also use other medicines more frequently. This study was performed to test this hypothesis. We compared the use of several drug classes in parents whose young children receive antibiotics recurrently with parents whose young children did not use antibiotics at all.

PATIENTS AND METHODS

Information on drug use was obtained from the IADB.nl database, which contains dispensing data from 55 community pharmacies in the Netherlands. Dutch patients usually register at one single community pharmacy, which means that these pharmacies are able to provide almost complete listings of prescribed drugs for individual patients.¹¹ Among other data, pharmacy data include information

on the name of the drug dispensed, anatomical therapeutical chemical classification, date of prescription, the number of days the drug was prescribed and the number of defined daily doses based on the WHO definition.¹² The use of over-the-counter drugs and in-hospital prescriptions is not included. The database covers a population of 500 000 people dating back to the year 1999, of whom 120 000 are younger than 19 years, and is representative of the Dutch population in terms of drug use.

Table 1 Characteristics of children, and their parents, who receive antibiotics recurrently versus those who do not receive antibiotics

	Recurrent use	No use	p Value
Children	n=1479	n=6731	
Boys (%)	55	49	<0.001*
Chronic use off† (%):			
antidiabetic drugs (A10)	0	0.01	–
dermatological corticosteroids (D07)	0.14	0.24	0.648
antiepileptic drugs (N03)	0.20	0.09	0.445
psychoanaleptics (N06)	0	0.03	–
antiallergics (R06)	0.07	0.03	0.951
asthmatic drugs (R03)	3.6	0.33	<0.001*
Mothers	n=1234	n=1032	
Age at birth of child	29.7±4.5	30.2±4.8	<0.001*
Chronic drug user† (%)	11.3	6.2	<0.001*
Number of drug groups used‡	1.32±0.6	1.20±0.5	0.04*
Fathers	n=1032	n=4250	
Age at birth of child	32.3±4.9	33.1±5.2	<0.001*
Chronic drug user† (%)	13.1	9.5	<0.001*
Number of drug groups used‡	1.25±0.7	1.24±0.6	0.886

*Significant difference.

†Chronic drug use: at least three times every year.

‡Of the group of parents with chronic drug use.

From the database, parents of children were identified as women living at the same address who were 15–50 years older or men living at the same address who were 18–50 years older. This method was validated in a former study and resulted in more than 99% accuracy.¹³

We identified a cohort of children who we followed until their fifth birthday and for whom we had at least 3 years of follow-up data. The parents were identified and were followed for 3 years after the child's birth. Recurrent use of antibiotics was defined as children receiving at least one prescription in each calendar year during the period of follow-up. With this definition the group was large enough for comparison with the group of children who did not receive antibiotics.

In addition to the use of antibiotics, other drug groups were investigated (tables 1 and 2). Chronic use of these drug groups was defined as receiving at least three prescriptions per calendar year of that specific drug group. This definition is based on an internal report which found that for most of the drug groups the prevalence of using three prescriptions of a drug group in a calendar year did not significantly differ from the prevalence of four, five or more prescriptions in a year.¹⁴

For all children (n=28 303) the number of antibiotic prescriptions per calendar year was calculated. Children who received more than 12 prescriptions in a year (n=47) were excluded because in these cases the use of antibiotics was considered to be for a specific indication.

We compared two groups of children (figure 1): children who did not receive any antibiotics (no use, n=6731), and children who received antibiotics recurrently (at least one prescription every year, n=1479). For these two groups of children, the following four groups of parents were selected: mothers of children with no use (n=5790); mothers of children with recurrent use (n=1234); fathers of children with no use (n=4250); fathers of children with recurrent use (n=1032).

Table 2 Chronic drug use of parents of children with recurrent use of antibiotic drugs and no use of antibiotic drugs

ATC	Mothers of children with recurrent use of antibiotics (n=1234)	Mothers of children with no use of antibiotics (n=5790)	RR (CI)	Fathers of children with recurrent use of antibiotics (n=1032)	Fathers of children with no use of antibiotics (n=4250)	RR (CI)
A02 Antacids	11	23	2.2 (1.1 to 4.6)*	30	68	1.8 (1.2 to 2.7)*
A06 Laxatives	3	11	1.3 (0.4 to 4.6)	1	5	0.8 (0.1 to 7.0)
A10 Diabetes	4	22	0.8 (0.3 to 2.5)	6	27	0.9 (0.4 to 2.2)
C Cardiovascular	16	54	1.4 (0.8 to 2.4)	26	67	1.6 (1.0 to 2.5)*
D05 Antipsoriatics	2	1	9.4 (0.8 to 103.4)	0	1	–
D07 Dermatological corticosteroids	8	37	1.0 (0.5 to 2.2)	8	29	1.1 (0.5 to 2.5)
M01 NSAIDs	21	22	4.7 (2.6 to 8.6)*	15	32	1.9 (1.0 to 3.5)*
N02 Analgesics	17	24	3.3 (1.8 to 6.2)*	8	17	1.9 (0.8 to 4.4)
N03 Antiepileptics	4	21	0.9 (0.3 to 2.6)	4	32	0.5 (0.2 to 1.4)
N05A Antipsychotics	3	16	0.9 (0.2 to 3.0)	3	14	0.9 (0.2 to 3.1)
N05B Anxiolytics	14	27	2.4 (1.3 to 4.6)*	8	26	1.3 (0.6 to 2.8)
N05C Hypnotics and sedatives	5	7	3.4 (1.1 to 10.5)*	4	11	1.5 (0.5 to 4.7)
N06A Antidepressants	30	88	1.6 (1.1 to 2.4)*	16	63	1.0 (0.6 to 1.8)
N06B Psychostimulants	0	0	–	1	4	1.0 (0.1 to 9.2)
R03 Obstructive airway disease	33	62	2.5 (1.6 to 3.8)*	29	76	1.6 (1.0 to 2.4)*
R06 Antihistamines	12	15	3.8 (1.8 to 8.0)*	12	36	1.4 (0.7 to 2.6)

*Significant difference.

ATC, anatomical therapeutical chemical; NSAID, non-steroidal anti-inflammatory drug.

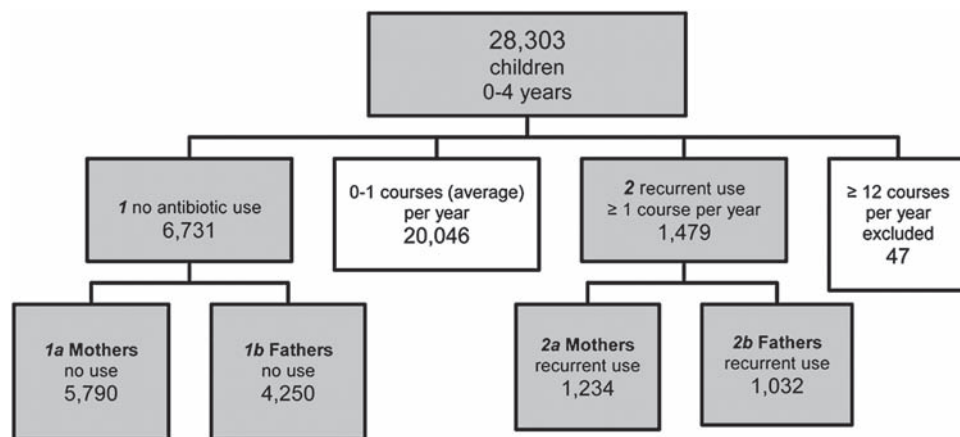


Figure 1 Flow chart showing the cohort selection of children and parents.

To compare chronic drug use among parent groups we calculated the prevalence of drug use for all drug categories together. We also calculated the RR (with CI) of the use of the different drug categories for parents (mothers and fathers separately) of children with recurrent antibiotic use compared with that of parents of children with no use.

Compared with other countries, especially in southern Europe, antibiotic prescription in children in the Netherlands is quite low.^{15 16} We investigated the use of antibiotic drugs in the whole cohort first before we selected the different groups for comparison. To obtain enough children in the group we defined recurrent use of antibiotics as at least one prescription every year.

Significant differences in continuous variables were calculated by using the independent samples t test. To compare percentages, the χ^2 test was used.

RESULTS

There were more boys in the group of recurrent antibiotic users (table 1). In both groups the use of drugs for chronic diseases was very low, with the exception of asthma drugs, which were significantly more common in the group who used antibiotics recurrently.

Mothers and fathers of children who received recurrent antibiotics were slightly older when their child was born compared with parents of children who did not receive antibiotics. Mothers and fathers of children who received antibiotics recurrently were more likely to be frequent users of medicines themselves compared with parents of children who had not received antibiotics. This applied to antibiotics and other medicines (figure 2). A total of 19.1% of mothers of children who received antibiotics recurrently used antibiotics recurrently themselves compared with 5.5% of mothers of children who did not receive antibiotics ($p<0.001$, χ^2 test). This difference was also significant among the fathers (9.1% and 3.3%, respectively; $p<0.001$).

Mothers of children who used antibiotics recurrently received significantly more prescriptions of antacids, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), anxiolytics, hypnotics and sedatives, antidepressants, drugs for the treatment of obstructive airway diseases and antihistamines (table 2). For fathers, we found a significant difference in the use of antacids, NSAIDs, cardiovascular drugs and drugs for the treatment of obstructive airway diseases.

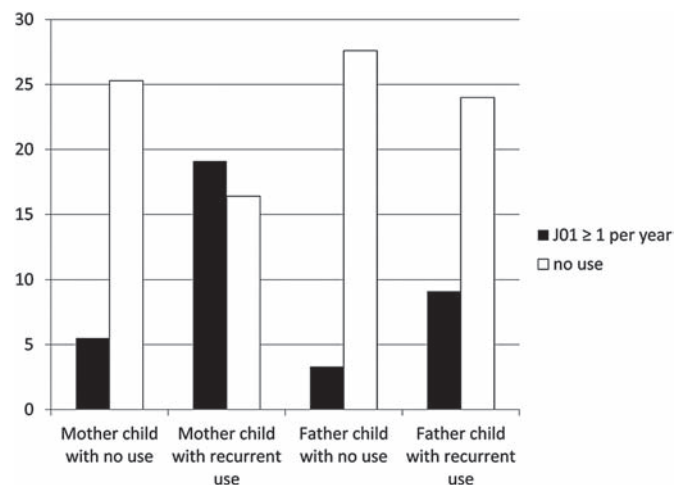


Figure 2 Antibiotic use of parents of children with no use and recurrent use of antibiotics. J01, the number of antibiotic prescriptions (≥ 1 per year).

DISCUSSION

The results of this study prove that parents of young children who receive antibiotics recurrently use more drugs themselves compared with parents of children who do not receive antibiotics in the first 5 years of their lives. This finding also applies to several other drug groups.

Substantially higher use of antibiotics by parents could partially be explained by the parents considering that susceptibility for infections could be inherited by their children. A similar explanation could apply for the higher percentage of asthma drugs used because there is an apparent association between the use of antibiotics and the use of more asthma medication in children.^{17 18}

However, the results also demonstrate that other medicines (antacids, analgesics, NSAIDs and psychotropic drugs) are more commonly prescribed to the recurrent user group of parents. These drugs share the characteristic that indication could be subjective and related to stress and anxiety. This suggests that these families are inclined to use medication sooner and more often. This is in accordance with the association found in earlier studies between recurrent antibiotic prescription in children and lower socio-economic classes, greater concerns about infectious diseases, a higher tendency to take sick leave from work and increased stress of fathers.^{5–10} It is likely that

these are parents to whom it would be difficult to explain that antibiotics are not always necessary when their child has an infection¹ because they are possibly less educated.^{9 10} We found that boys were more likely to receive medicines and this is in keeping with a previous Dutch study looking at prescriptions for respiratory symptoms in the first year of life.¹⁹

Another factor is that parents and their children are usually treated by the same physician. Some physicians prescribe medication more easily than others. Because the number of different physicians in the study group is heterogeneous and large with no information about them, it is not possible to examine the influence of the physician in this study. New studies are needed to look into this.

The mother's use of medicines is more related to the child's use than the father's use. This may be because mothers are usually more involved with the care of the children. Mothers suffering from chronic illnesses like diabetes or cardiovascular disease consult their physician more often, giving them ample opportunity to ask for antibiotics when their child has an infection.

The results of this study indicate that drug use and health beliefs of parents could be an important factor in predicting the prescription of antibiotics in their children. Therefore healthcare professionals have to be very attentive in their communications with parents when they intend to reduce the use of antibiotics in children and decrease the risk of developing resistance.

The advantage of this study lies in its use of large groups and objective data on drug use from a prescription database. However, the use of these data also has some limitations: the factual indications of the drugs are unknown, and the assumed relationship between the child and the 'parent' is not validated but is assumed in most cases to be correct.¹³

CONCLUSION

Parents, especially mothers, of children who receive antibiotics recurrently use more medicines compared with parents of children who do not receive antibiotics. This finding also applies to other drug groups like analgesics and psychotropic drugs. Parents' drug use probably influences that of their children and is a factor physicians and pharmacists should take into account. Parents could be educated to manage their own use of medicines and that of their children.

Contributors Josta de Jong performed the study and wrote the manuscript. Jens Bos, IT specialist and programmer, developed the databases and assisted in selection and analysis of the data. Tjalling de Vries advised in the study design, analysis and writing of the manuscript. Lolkje de Jong-van den Berg was supervisor and advisor during the performance of this study.

Competing interests None.

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